

Clearing the way for the rescue teams – DLR develops emergency traffic management system

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An explosion occurs in a densely populated area. Police and rescue workers are called out and race to the place where it happened - in theory. Yet, how soon do they really arrive at the scene of the incident? Which is the best route to take? How can the impact on regular traffic be kept to a minimum? DLR is developing systems that will provide effective traffic management in the case of a crisis.



On a mission: police vehicles blocking a motorway.

Credit: DLR

Germany, the land of car lovers. Our network of roads and motorways is closely knit. Most of our goods are transported by road. Even in everyday traffic, the system is sometimes running up against its limits. Police, fire brigade and rescue services usually have to reach their destination by road vehicles, too. It is understood that in an emergency, regardless of its dimension, saving lives has priority over the interests of other road users. Yet, vehicles with blue flashlights and a siren seldom have a clear road ahead of them. Their arrival is often delayed by dense or slow moving traffic. What is more: Disruptions and failure of the traffic infrastructure may have considerable consequences for rest of the population, too.

In order to guarantee that there will be no obstruction either for the emergency crews or for regular road users, an integrated traffic crisis management system is of the essence. So far, such a system does not exist in Germany. Administrative responsibilities are distributed on many shoulders, both in geographic and organisational terms. To overcome these regional, demarcational and structural hurdles, DLR is developing effective systems to support emergency missions at its Institute for Transportation Systems. Federal, state and local transport and emergency response authorities are making an active contribution. The intention is to create an integrated emergency traffic management system for future emergencies.

EmerT creates a common platform

The result of these efforts is called EmerT (Emergency mobility of rescue forces and regular Traffic). An innovative type of traffic and emergency response system, it combines situation updates with information on current decisions on a common platform. Complementing EmerT, an airborne traffic surveillance system monitors the traffic flow and infrastructure situation over an extensive region and produces aerial images as additional information material on an ongoing basis.



On a mission: DLR's EmerT system during a THW exercise situation in Munich, September 2009.

Credit: DLR

EmerT supplies the authorities and organisations involved with images of the current traffic situation, along with forecasts and analyses. Decisions on measures such as road closures can quickly, virtually at the push of a button, be communicated to other authorities. A further benefit of the system is that it helps overcome demarcation mentalities and supports a more process oriented practice.

EmerT creates a picture of the overall traffic situation based on current traffic and infrastructure data. Data on traffic flow originate from traffic sensors operated by local and state authorities, such as induction loops embedded in the surface of federal motorways. DLR processes these data to build a full situation chart. Where necessary and where possible DLR also fills in additional material from its own aerial imaging and sensor systems, such as Floating Car Data (FCD). These are real-time traffic data received by DLR from the dispatch systems of taxi booking agencies. Where no continuous data are available the situation can be assessed by means of traffic simulations. These are based on expected traffic frequency, reconciled with current sensor data from adjacent areas. The key to success lies in an intelligent combination of the various systems, providing a traffic status picture for an entire region – even across administrative demarcation lines.

This is how EmerT enables its users to get a quick picture of the current traffic situation, evaluate it and take appropriate action. Also, simulations help predict the likely traffic development, so that traffic management measures can cut in before a gridlock can occur, thus permitting the operation headquarters to act, not react. In addition to displaying traffic status and forecasts, the system will have optional functionalities to assist with traffic management and logistics support operations such as, for instance, route control and route recommendation. These features will help combine and coordinate traffic management and disaster response processes.

Project VABENE – work in progress



A street junction in Munich; photo taken by DLR's 3K camera system from a height of 1000 metres above ground. Coloured dots mark automatically detected vehicles and their speed. The colours represent the speed, ranging from red representing a traffic stoppage to green for fast traffic flow.

A DLR-based project called VABENE is currently fine-tuning the system. The team's main current activities are to develop enhanced sensors, build a mobile ground station for airborne traffic monitoring and develop further process-controlled assistance features for traffic management and operational logistics. A road closure assistant is being developed to facilitate the cross-organisational definition and enforcement of an exclusion zone around a given operating location. Another plan is to perform up-front simulations to determine the impact of potential traffic control measures, which would give officers in charge valuable decision support. DLR scientists also work on better interfaces between mission control and traffic guidance systems. The current regime of traffic data acquisition will be expanded: next to optical data acquisition, traffic flow and infrastructure data will also be recorded by airborne radar devices. This will provide reliable status information even on a foggy day or when the sky is covered in clouds.

Scientists from one of DLR's main research areas, transport, is involved in this project, which at the same time forms part of DLR's security research, a cross departmental programme under which defence- and security-related research and development activities are being planned and controlled.

Vision: an adaptable response system

A disaster will not stop at the border of a state or a local district. This is why DLR recommends the technology to be used flexibly. The focus should be on cross-state forecasting and analytical functions but especially on cross-departmental and cross-territorial processes. The system is all about simplifying data management. Harmonisation across any of these boundaries will result in valid datasets and help avoid inconsistencies. Well-defined interfaces and well-aligned data exchange processes can bring about a marked improvement in the way in which information is delivered to all responsible parties. Instead of having to handle a large variety of individual situation reports, status information would be comprehensive. A prototype of the system has been tested on several occasions such as large-scale police operations and a disaster relief exercise of THW, the Federal Agency for Technical Relief. In essence, the system was shown to be ready for use. An initial pilot operation is now planned that will involve several federal states and regions.

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